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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/667,706	09/22/2000	Ken Inoue	NEC00P267-hk	9955

7590 03/17/2004

McGinn & Gibb, PLLC
8321 OLD COURTHOUSE RD.
SUITE 200
VIENNA, VA 22182

EXAMINER

OWENS, DOUGLAS W

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 03/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/667,706	INOUE ET AL.	
	Examiner	Art Unit	
	Douglas W Owens	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-9 and 12-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 5-9 is/are allowed.
- 6) ☒ Claim(s) 12-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12/30/2003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 22, 2003 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 12, 14, 15, 16, 19 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by US patent No. 6,436,753 to Ikeda et al.

Regarding claims 12, 14 and 15, Ikeda et al. teaches a method of making a semiconductor device (Figs. 14 and 15, for example) having a memory cell section and an adjacent circuit section, said method comprising:

forming a metal film comprising cobalt (Col. 15, lines 20 and 21) directly on surfaces of highly doped source-drain regions and gate regions in said memory cell section and said adjacent circuit section; and

annealing said device to react said metal with surfaces to concurrently form a metal silicide layer in each of the memory cell section and the adjacent circuit section (Col. 15, lines 23 and 24).

Regarding claim 16, Ikeda et al. teaches a method, wherein forming the metal film comprises a sputtering method (Col. 15, lines 21 – 23).

Regarding claim 19, Ikeda et al. teaches a method, further comprising:
forming an Ohmic contact on the silicide layer on a source-drain region (Col. 15, lines 30 – 55)

Regarding claim 20, Ikeda et al. teaches a method further comprising:
forming source-drain regions in the memory cell section and the adjacent circuit section.

Claim Rejections - 35 USC § 103

4. Claims 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. as applied to claim 12 above, and further in view of US Published Patent Application No. 2002/0004303 to Agnello et al.

Regarding claims 13 and 17, Ikeda et al. teaches a method of manufacturing a semiconductor device, wherein forming the metal film comprises forming a metal film over an entire surface of the substrate, and wherein the heat treating comprises:

heating the device;

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removing the unreacted metal film; and

heating the device again (Col. 15, lines 22 – 28).

Ikeda et al. is silent with respect to the specific temperature of the thermal process. It would have been obvious to one having ordinary skill in the art to arrive at the optimal temperatures through routine experimentation since Ikeda et al. only discloses that the thermal steps are performed without disclosing a preferred range of temperature and time.

Ikeda et al. does not disclose removing the unreacted metal film with sulfuric acid and hydrogen peroxide. Agnello et al. teaches removing unreacted metal (cobalt) using hydrogen peroxide and sulfuric acid (section [0007]). It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Agnello et al. into the method taught by Ikeda et al., since it is desirable to use a solution that would have reliably removed the unreacted metal.

Ikeda et al. does not teach heating in a nitrogen atmosphere. Agnello et al. teaches performing the thermal steps in a nitrogen atmosphere (section [0007]). It would have been obvious to one of ordinary skill in the art to perform the anneal steps in a nitrogen atmosphere, since it is desirable to prevent undesired oxidation during the anneal step.

5. Claims 18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al.

Regarding claim 18, Ikeda et al. teaches that the metal film may comprise cobalt "...or the like..." (Col. 15, lines 21 and 22). It would have been obvious to one of

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ordinary skill in the art to use a material such as nickel (atomic No. 28, atomic weight 58.6934), which has similar properties to cobalt (atomic No. 27, atomic weight 58.933200), and can be considered to be very cobalt-like.

Regarding claim 22, Ikeda et al. teaches a method, wherein forming source-drain regions comprises implanting arsenic ions (Col. 14, lines 61 – 64), but is silent with respect to the dose and energy of the implant. It would have been obvious to one having ordinary skill in the art to arrive at the optimal implant dose and energy through routine experimentation, since Ikeda et al. only discloses that an implant is performed, but is silent with respect to the preferred dose and energy.

6. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. as applied to claims 12 and 20 above, and further in view of S. Wolf et al., SILICON PROCESSING FOR THE VLSI ERA, volume 1: Process Technology.

Ikeda et al. does not teach implanting BF₂ ions at 20 KeV at a dose of 3×10^{15} atoms/cm². Wolf et al. teaches that BF₂ is a commonly used acceptor ion, as well as being an art recognized substitution for boron implants. Additionally, The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Allowable Subject Matter

7. Claims 5 – 9 are allowed.

8. The following is a statement of reasons for the indication of allowable subject matter: The art of record does not disclose a method incorporating a DRAM device in the memory section.

Response to Arguments

9. Applicant's arguments with respect to claims 12 – 22 have been considered but are moot in view of the new ground(s) of rejection.

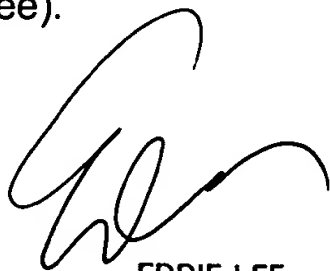
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 571-272-1662. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DWO



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800